the presence of the sarcomatous mass in the liver is not explained unless it be considered as a primary tumor, and its association with cirrhosis of this organ must be considered quite unique. The examination of the literature of cirrhosis of the liver, especially the standard textbooks and the various medical indices, fails to reveal any quotations of a similar combination of sarcoma and cirrhosis, although such cases have doubtless been already reported, possibly under different names, yet the combination represented by the present case is, as far as we know, the first case to be reported in this country.

REPORT OF A CASE OF MELÆNA NEONATORUM DUE APPARENTLY TO AN INFECTION BY THE BACILLUS PYOCYANEUS.

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The case, the subject of this report, is that of a boy born at term in the Maternity Hospital of Philadelphia. Presentation was of the vertex, and the labor lasted but six hours. Weight of child at birth was 3350 grammes. The child seemed perfectly healthy, and the cord separated without incident, except that the period between birth and separation was decidedly shorter than usual. Nothing abnormal was noted in the condition of the child until the sixteenth day, when the resident physician called my attention to it because its mouth had become sore. On examination the condition of the mouth was seen to be due to a slight stomatitis. There was no temperature rise. The next day, while the mouth did not seem to have improved as much as I expected, and a little blood was noticeable upon the lips, the condition of the child was not apparently at all changed for the worse, except that there was a slight elevation of temperature and that its bowel movements had become green. On the following day, however, the whole appearance of the child had markedly changed. The temperature, while not excessively high, was distinctly febrile, and the slight trace of blood noticed previously had become a constant flow, apparently from the mucous membrane of the entire mouth. The bleeding was so profuse that all attempts to examine the mouth and pharynx were unavailing. The child, indeed, had to be watched carefully to prevent embarrassment of the breathing from the constantly flowing blood. Decided loss of strength was apparent. The lungs were negative. All attempts at nursing were futile. The stools at this time contained blood in considerable quantity and of a bright red color. The condition continued unchanged, except for the occurrence of a few convulsions, until the next day, the nineteenth since birth, when death took place.

The clinical diagnosis was simply melæna neonatorum, as during life there were no facts at command which would enable a more definite diagnosis to be made. The possibility of its being a case of hæmophilia occurred to me, but the age of the child, the association of febrile temperature, and the absence of history, seemed to preclude any etiological relationship.

The post-mortem examination was made by the pathologist of the Maternity Hospital, Dr. Joseph Sailer, to whom I desire to express my most sincere thanks.

The notes were elaborate, and from them I have abstracted the most important facts.

The body was decidedly emaciated. A large, distinct, hemorrhagic effusion noticed around the umbilicus.

Abdominal cavity: No subcutaneous fat. Hemorrhage noted into the wall of the umbilical cord, and hemorrhagic effusion into the peritoneum. The cæcum was distended and somewhat adherent to the abdominal wall. In the neighborhood of the umbilical artery the peritoneum was dry and sticky. The ileum was of a slaty color, due to contained blood. The mesentery was intensely congested. The mesenteric glands not enlarged. No ecchymotic hemorrhages.

Thoracic cavity: Pleural cavities were free and contained no fluid. The pericardium was smooth, but intensely congested, particularly along the line of the anterior coronary artery.

The lungs: Pale. Numerous subpleural ecchymoses, and some areas of consolidation were found on the right side.

The heart: The right auricle was distended with blood. The foramen ovale was widely patulous. No coronary valve was present. The ductus arteriosus was not investigated. Otherwise the heart was normal.

The spleen: Normal.

The ileum: Filled with a dark-brown granular mass, which was readily removed, leaving a smooth, glistening and pale mucous membrane which showed no congestion. The folds of the ileocæcal valve contained a firm, slightly adherent clot. There was no sign of ulceration in the intestinal tract. The common bile-duct was patulous. The mucous membrane of the duodenum was clear and but slightly bile-stained.

The stomach contained a small amount of bile, but no blood. The mucous membrane was very rugous. There were no ecchymoses.

The œsophagus was filled with blood-stained mucous.

The liver was enlarged and soft, and its surface on section was distinctly cloudy. The structure was indistinct.

The pancreas was soft. There was no hemorrhage present, and its structure appeared to be normal.

The adrenals and kidneys were both apparently normal.

The brain was apparently œdematous. The membranes were very cloudy. There were no hemorrhages either into the substance or ventricles.

The histological and bacteriological examinations were made by Dr. Sailer in the Pathological Laboratory of the University of Pennsylvania.

On section through the duodenum some superficial necrosis in the mucous membrane was present, and also moderate proliferation of the epithelium cells of the villi. Very slight perivascular round-cell infiltration in the submucosa. The muscularis was normal. There was a slight exudate on serous coat. High magnification gave some cloudy swelling in the epithelial cells of the villi, and many of the cells were seen to contain swollen and pale nuclei. The walls of the bloodvessels were found to be slightly thickened.

The peritoneal exudate contained some rod-shaped micro-organisms in the superficial necrotic areas of the mucous membrane. In this area there were some cells whose nuclei were large and stained deeply, the protoplasm of the cells also taking a portion of the stain.

The pancreas showed a distinct hyperplasia of the connective tissue surrounding the bloodvessels, with some round-cell infiltration. The ducts were lined with apparently normal cylindrical epithelium, with deeply staining nuclei between the lobules. The connective tissue was generally hyperplastic, and showed here and there a few accumulations of round cells. The bloodvessels were distended with blood and their walls were distinctly thickened. In some of them the intima was detached and in others distinctly swollen. The media was slightly hypertrophied, but the thickening affected chiefly the adventitia, which was usually about twice the thickness of the media. The walls of the veins were distinctly thickened and surrounded by a mass of fibrous connective tissue. The cells of the pancreas stained very irregularly. In many of them there was distinct alteration of the protoplasm which stained deeply with eosin. In many places the granular acini were pushed apart by dense infiltration of cells having round or oval nuclei. The bodies of Langerhans were numerous, frequently slightly lobulated, and in some places there was apparently degeneration in the cells, the nuclei being enlarged, irregular, and staining very deeply, the protoplasm retaining the hæmatoxylin stain. Staining by thionin gave essentially the same changes. No micro-organisms could be detected in the tissues. Occasional eosinophile cells were observed in the midst of the cellular infiltrate. Many of the nuclei of the cells of the pancreas showed extreme vacuolation. In some cases two deeply staining nuclei were found in the same cell. Vacuoles also occurred in the cellular protoplasm.

The liver showed the same hyperplasia of the connective tissue, with moderate round-cell infiltration, particularly perivascular, as in the pancreas. The bloodvessels were distended. The bile-ducts were apparently normal. Here and there the substance of the liver was infiltrated with red blood cells. The small vessels of the substance were surrounded by round cells possessing a single round vesicular nucleus. The arterial walls were greatly thickened, particularly the adventitia. The walls of the veins were also considerably dilated and surrounded by connective tissue. The nuclei of the liver cells were all about of equal size and stained distinctly with a clear chromatin. In addition, there were a number of small cells with deeply staining nuclei, and some larger round cells, the protoplasm of which retained the hæmatoxylin stain. With immersion the nuclei could be seen to have the normal structure. The small dark cells were evidently polynuclear leucocytes. There were in addition certain cells showing fragmentation of the nuclei. The protoplasm of the liver cells took eosin stain faintly. There were some clear globules in the tissue. The radicles of the hepatic vein were distinctly distended, but were apparently normal. The portal vessels were also distended, but not markedly. The protoplasm of many of the hepatic cells appeared to be slightly granular. There were no organisms found in the tissues. The intestines showed a moderate necrosis of the superficial layer of the mucosa and some thickening of the submucosa, with considerable round-cell infiltration about the glands. The serous coat appeared to be normal. The epithelial cells were in part desquamated, and appeared to have proliferated. The epithelial cells of the crypts were normal. The bloodvessels showed a slight thickening of the walls. The mucuous membrane contained a large quantity of rod-shaped bacilli.

The spleen: Trabeculæ were prominent, and the walls of the bloodvessels were tremendously thickened, particularly the adventitia. The perivascular connective tissue was also distinctly hyperplastic. In some areas there was intense perivascular round-cell infiltration. Throughout the greater part of the tissue in this section there was hemorrhagic diffusion, but other parts were relatively free. The nuclei of the cells stained distinctly. There was no evidence of giant-cell formation or of fragmentation. The capsule was about normal in thickness, but it sent several trabeculæ into the substance which were quite thick, and which branched more or less extensively. The presence of a very few rod-shaped organisms was determined in the substance.

The thymus showed slight degenerative changes, as did also the tail of the pancreas.

To recapitulate: There was found post-mortem a generalized parenchymatous degeneration of the organs, a sclerosis of the pancreas, an acute enteritis, and a commencing cirrhosis of the liver.

The perivasculitis, the cirrhosis of the liver, together with the sclerosis of the pancreas, approached the changes found in senility. Finally, it is to be especially noted that there were no other evidences of syphilis.

The presence of a chronic pancreatitis in a new-born child is, I believe, in the absence of syphilitic manifestations, of sufficient rarity to deserve at least passing notice. The usual cause of connective tissue overgrowth in this organ is, of course, syphilis, and when it was found I was somewhat inclined to believe that we might have been dealing with a case of that disease, in spite of the fact that there were no other signs.

In looking up the subject more carefully, however, I have found that the presence of a connective tissue hyperplasia in the pancreas has been noted in the new-born in various conditions. Kasahara,[1] in the Pathological Institute of the University of Berlin, made some particularly interesting studies of the condition. His article gives a list of cases in which this condition was found at post-mortem, and among his cases he was able to tabulate twenty-two in children whose ages varied from a few months to several years.

Among these children he found six in whom there was a marked hyperplasia of the pancreatic connective tissue, and four in whom it was moderately increased. The remaining twelve cases showed but the normal amount. In all of these cases the author says that the diseases causing death could in no case have been the cause of the interstitial pancreatitis, and he also excluded syphilis by most careful search for other signs. He is somewhat disposed to accept the condition as a physiological one, and calls attention to the relative richness in connective tissue at times found in the pancreas in childhood.

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[1] Ueber das Bindegewebe des Pankreas bei verschiedenen Krankheiten. M. Kasahara. Kioto, Japan.

The diseases which caused the death of these children were very dissimilar, as the subjoined tabulation shows:

CASE I. Child, aged eight months; cause of death, diphtheritic colitis.

CASE II. Child, aged two months; cause of death, catarrhal gastroenteritis, hemorrhagic parenchymatous nephritis, with thrombosis of the left renal vein.

CASE III. Child, three months; cause of death, bronchopneumonia and atelectasis.

CASE IV. Child, aged two and one-half months; cause of death, catarrhal enteritis and pulmonary œdema.

CASE V. Child, aged one and one-half year; cause of death, marasmus.

CASE VI. Child, aged six months; cause of death, catarrhal enteritis, bronchitis, bronchopneumonia, parenchymatous nephritis.

CASE VII. Child, aged one and one-half year; cause of death, catarrhal gastro-enteritis and atelectasis.

CASE VIII. Child, aged eight years; cause of death, phthisis pulmonalis.

Bacteriological Examination. At autopsy cultures were made from the heart's blood, left lung, spleen, liver, peritoneum, brain, contents of the ileum, and the bile.

The staphylococcus pyogenes aureus was recognized by the color of its colonies and its staining and culture peculiarities in the heart's blood, spleen, and brain.

The bacillus ærogenes lactis was similarly determined in the heart's blood, spleen, and peritoneum. The latter was also found in plates made from the contents of the ileum.

From the bile two micro-organisms were obtained, the one a long bacillus forming gas with glucose, and turning litmus milk-white without coagulation. This bacillus did not liquefy gelatin, did not stain by Gram's method, and was non-motile. In all its peculiarities it resembled the bacillus ærogenes lactis. The other bacillus found in the bile was a typical growth of bacillus pyocyaneus. Its identity was determined by the characteristic waving motion, by the deep bluish-green staining of the media, by the dark-blue color which it produced in strongly alkaline media, and by the rapidity of its liquefaction of gelatin.

From the liver tissue there were obtained the bacillus ærogenes lactis, the staphylococcus aureus, and the bacillus pyocyaneus.

In the left lung only the staphylococcus aureus was found.

A guinea-pig was inoculated with fresh bouillon culture of the staphylococcus aureus. It died the next day, and growths were obtained from all its tissues. The lesions were characteristic. Another pig was inoculated with the bacillus ærogenes lactis, and died within twenty-four hours. Pure cultures of the micro-organism were obtained from its tissues.

A third pig subsequently inoculated with the bacillus pyocyaneus died within twenty-four hours. Cultures were obtained from all its tissues.

It appears, therefore, that these three micro-organisms, which were distributed more or less generally through the tissues, were without exception virulent.

To recapitulate: There were three acute infections, two of which, the bacillus ærogenes lactis and the staphylococcus pyogenes aureus, were general, while the third infection, due to the bacillus pyocyaneus, was local, it being found only in the tissues of the liver and in the bile. That all three were virulent was proven experimentally.

The comparatively recent time of making the post-mortem, together with the marked localization, would seem to do away with any question of post-mortem invasion of the bacillus pyocyaneus. Also, the presence of the bacillus ærogenes lactis in the heart's blood would prove that its invasion was ante-mortem, as otherwise, though in a normal inhabitant of the intestine, it would not have been found in the heart in the absence of advanced putrefaction, since it is a non-motile bacillus.

The bacillus pyocyaneus has been known since 1882, when Gessard, "La Pyocyanine," *Thèse de Paris*, for the first time proved that the blue or green stain at times noticed on surgical dressings, and which, as early as 1860, had been isolated in the form of a coloring principle by Fordos (*Compt. rend. Acad. des Sciences*, 1860), was due to this bacillus, which he for the first time isolated in pure culture. For a long time subsequently, however, the organism was considered as a saprophyte, and even after it was shown as the probable cause of local or external pathological conditions it was still held, as, for instance, by Schimmelbusch, that it was limited in its action to the exterior of the body.

Many observers have noted its presence in abscesses of the ear and mastoid disease, and it also has been found in the pus of wounds upon the surface of the body. Its occurrence, however, upon the surface of the body cannot be considered common, as Jakowski was only able to find it twice in 200 cases.[1] It has also been found in tubercular cavities by Koch. Babes[2] reported a localized infection of the umbilical cord as due to it. Other investigators have recently found it within the body, as, for example, Barker (*Journal of the American Medical Association*, 1897), who determined its presence in an ovarian abscess, and Lartigau,[3] in purulent peritonitis. Charrin, 1894, reported its presence associated in puerperal fever with a few streptococci. Ehlers[4] was the first to call attention to its power of producing general infection. Brill and Libman,[5] in reporting a case of pyocyaneus bacillæmia, called attention to the great danger of post-mortem invasion, both by the bacillus pyocyaneus and the colon bacillus, due to their motility. According to these authors, there are only five cases worthy of credence, none having been reported previous to 1893, and they cite the belief of Schimmelbusch, that although local infections and resulting toxæmias were undoubtedly caused by it, yet it could not invade the organism.

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[1] Zeitschrift f. Hygiene, vol. xv. p. 475.

[2] Gaz. Med., Nantes, 1895.

[3] Journal of Experimental Med., 1898, vol. iii.

[4] Hosp. Tid. Kjobenh, i. 1890.

[5] AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Aug., 1899.

The five cases considered by them as cases of general infection of this bacillus are as follows:

First, a case reported by Williams and Cameron in a child aged seven months. In this case no cultures were obtained from the blood ante-mortem, but post-mortem the capillaries of the liver, kidneys and spleen were found blocked with minute bacilli, proving by culture to be the bacillus pyocyaneus. The organs showed parenchymatous degeneration. Autopsy was made soon after death.

The second case, reported by Finkelstein, was a child, aged three months, with hemorrhagic diathesis. Blood cultures were made from the vein two days ante-mortem, showing the bacillus pyocyaneus and the colon bacillus. The presence of the bacillus pyocyaneus was determined in the stools and also in the blood aspirated one-half hour post-mortem. This is the first case in which the bacillus pyocyaneus has been found in the blood by culture during life.

The third case reported by Blum[1] from the clinic of Professor Escherich was that of a syphilitic child presenting the symptoms of fever, loss of weight, and also the presence of blood-filled vesicles on the great and second toes. Auscultation revealed a loud, rough systolic murmur. Death occurred after thirteen days. The post-mortem in this case showed a lobular pneumonia, the liver changes usually found with syphilis, pericardial effusion, and a thickening of the edges of the bicuspid valves. In this case the blood drawn from the ear on the day before death showed the presence of the bacillus pyocyaneus. The blood taken from the heart one and one half hour after death also showed the presence of the same bacillus by culture. Endocarditis was also experimentally produced in a rabbit.

The fourth case, reported by Czerney and Moser, a child, aged seven days. Blood cultures from the finger tips showed the bacillus coli communis and bacillus pyocyaneus. This case may be considered doubtful because of the method used. But many control experiments were made.

The authors report their case as the fifth, and claim it to be the second in which the bacillus was found during life in a manner excluding doubt. They also claim it as the first case reported in an adult, and thus show that the infection is not confined to infancy.

Bleeding from some portion of the body of the new-born child is not a very rare condition if we include the frequent cases of slight bleeding from the cord or the umbilical ulcer after separation. This form of hemorrhage is not associated with any general symptoms, unless the amount of blood lost be so great that a resulting acute anæmia be produced. If such be the result it means, in the vast majority of cases, that the medical attendant or nurse has been negligent, such hemorrhages occurring usually because of the patulosity of the umbilical vessels, which may be usually easily controlled by firm pressure and hæmostatics. The so-called precocious menstruation may be considered of the same type, as it is usually not associated with constitutional reaction.

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[1] Centralblatt f. Bakteriol., Parisit. und Infections-Krankheit., February 10, 1899.

In contradistinction, however, to this slight local bleeding we meet with a condition more rarely in which, as in the case reported, the bleeding is associated with general symptoms and the clinical picture is of an infectious process.

That this latter condition, to which the term hemorrhagic diathesis should be limited, is not very rare, is shown by the statistics of Ritter, who met with it 190 times in a series of 13,000 births at the Prague Lying-in-Asylum, and Epstein in the Prague Foundling Asylum, who pronounced it present in 8 per cent. in a series of 740 infants. Hecker, quoted by Osler, states its frequency as 1 in 500. Buhl's statistics are the same, while Spiegelberg gives it as 2 in 5000 and Genrich as 1 in 2800. The statistics of the Lying-in-Hospital in Boston are given as 0.57 per cent. in a series of 7225 cases.

Though authorities have agreed that the occurrence of hemorrhagic manifestations of a severe grade is less frequent in private than in hospital work, a fact which would certainly indicate the infectious nature of at least a portion if not all cases, still its causation until very recently has been attributed to syphilis or some local lesions, as ulcers of the intestinal tract. The comparative rarity, however, of any syphilitic manifestations in hemorrhagic cases, 2 per cent. to 6 per cent., according to Epstein, Ritter and Townsend, shows conclusively that it cannot be the cause in the vast majority of cases. Further, in Townsend's series of fifty cases, quoted by Rotch, there were in the nine cases examined by post-mortem no ulcerations of the mucous membranes or blood-vessel lesions found, and Duser,[1] quoted by Holt, found in a series of twenty-nine port-mortems but thirteen cases in which ulcerations of the mucous membranes were present, nine being in the stomach and four in the intestines.

Thus the relative infrequency of the occurrence of syphilis and ulcerative conditions in the cases of hemorrhage which have been reported may lead us to question their causal relationship even when present, and the doubt is still further increased when one remembers the statistics of Mracek, who found in a series of 132 cases of congenital syphilis but 14 per cent. the subject of hemorrhage.

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[1] Thèse de Paris, 1889.

Ulcerations may, of course, be the cause of the hemorrhages in the few cases in which they are found, but authorities seem disposed at present to consider such cases as primarily septic, the ulcerations very probably being due to septic emboli predisposed to by the relation of the vessels of the stomach and duodenum, the thrombus being situated in the umbilical vein.[1]

Sepsis due to the ordinary pyogenic organisms seems at first sight, indeed, to play a more important causative rôle in the production of this diathesis than the previous conditions, since in an examination of 61 cases of sepsis Epstein found hemorrhagic conditions associated in 29, and Ritter in a series of 190 cases found the same association twenty-four times. That the relationship which, judged from the above statistics, might seem to exist between ordinary septic infection and hemorrhagic manifestations cannot be considered as valid is shown by the statistics of the Sloane Maternity Hospital, as follows: In a series of 1500 cases of labor in that institution during a period entirely free from septic trouble of any kind there was no case of hemorrhage observed, but in a subsequent series of 225 deliveries observed during the presence in the house of septic cases there were eight babies who developed hemorrhage. In the cases of hemorrhage observed, however, there were none of the usual septic manifestations, while in the cases of sepsis of the ordinary variety, present at the time, there was an entire absence of any hemorrhagic manifestations.

It would seem probable, therefore, that the etiologic rôle played by the usual type of pyogenic infection in the production of cases of hemorrhage can only be considered as one of predisposition.

As has been said, syphilis was formerly considered to be the cause of hemorrhagic disease, but the absence of syphilitic signs and history in many of the cases reported have led Neuman and Ritter and others to doubt the causal relationship and to relegate its influence in the production of these cases to that of predisposition. That syphilis has an important influence in predisposing to infection is well known, and has been emphasized by Epstein[2] and proven bacteriologically by Kassowitz and Hochsingen, and by Chotzen and Kolisko.[3]

Rotch thinks that the hemorrhages under discussion are probably symptomatic of different specific diseases, and the fact that the disease is self-limited in the cases that recover seems to point strongly to the same conclusion. It is a very interesting fact that cases after recovery show no tendency to a recurrence or to hemorrhage from the umbilicus on separation of the cord, even though it had been one of the bleeding-points during the course of the disease. Holt states also that circumcision has been performed a few days after the cessation of bleeding without any resulting hemorrhage.

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[1] Landau, Ueber Melena der Neugeborenen, Breslau, 1874.

[2] Oesterr. Jahrbücher f. Pædiat., 1876.

[3] Neumann, Archiv. f. Kinderheilkunde, 1890.

From the different cases of hemorrhage of this variety which I have found in the literature the general symptom-complex seems to agree well in general with the description given by Lartigau,[1] who says that the symptoms resemble other better known forms of septicæmia and some of the acute febrile diseases. He gives the symptoms at the outset as weakness, prostration and fever. Pulmonary disturbances and pleurisy are often present. Epistaxis is noticed at times, and tympany is present as a rule. Splenic enlargement he seems to consider quite constant. Diarrhœa and vomiting are present, and both at times contain blood. Cutaneous changes noticed are of the form of bullous eruptions or petechiæ, or rarely a papular rash may be observed. The eruption usually occurs on the trunk, limbs, or scrotum, and may appear either early or late. Death occurs in from forty-eight hours to five days as a rule, though sometimes later. Loss of weight is constant in cases which live long enough to show it.

The previous condition of the children who present this grave form of hemorrhage differs so widely that nothing can be learned by its consideration. Thus some cases before the development of bleeding have shown general weakness and intestinal disorders, and others, as was true in the present case, are perfectly healthy until the onset of the acute symptoms.

The situation of the hemorrhage may be in any tissue or organ of the body, but usually is found at the umbilicus or in the mucous membranes of the stomach or intestines or beneath the skin. Rarely internal hemorrhage may destroy the life of a child without any external evidences of bleeding. The onset is in the majority of cases sudden, and occurs usually before the twelfth day, though cases have been reported as late as the sixth week, and Lartigau,[2] in investigating an epidemic of dysentery due to the bacillus pyocyaneus, found three fatal cases in children aged nineteen months, five years, and four years respectively, and one fatal case in a man aged thirty-five years.

The cases that recover do so usually in a very few days, but no series of cases will present probably more than a third of the number resulting in cure. Townsend in a series of 709 cases found a mortality of 79 per cent.

The cause of death usually seems to be loss of vital force rather than an acute anæmia. But in the present case the latter seemed to me to be the cause of death, since the amount of blood lost was so great.

If we conclude, as seems to be justifiable from the symptoms presented by this child in connection with the post-mortem conditions and bacteriological findings, that it was a true case of infection by the bacillus pyocyaneus, we have still to consider the question, to me the most interesting of any which the case presents, namely, how did infection occur in this instance without being operative in the other babies present in the wards of the hospital at that time and living under the same hygienic conditions? Unfortunately, the facts at command are not sufficient to form a basis for conclusions, and I can only present an inference which, while supported by absolutely no proof, still seems to me to be the most plausible explanation of the development of a sporadic case of this type.

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[1] Brill and Libman, AMERICAN JOURNAL OF THE MEDICAL SCIENCES, Aug., 1899.

[2] Journal of Experimental Medicine, 1898, vol. iii.

In the consideration of cases of infection in general we can divide them all into two great groups: first, those in which the infection arises from internal causes, auto-infection, and, second, those arising from external causes. To consider the first group, or auto-infections: With regard to this particular case we may assume, I believe, that if the infection took place from within the source would be found in the intestinal canal, since the development of the most marked symptom, the hemorrhage, developed in that locality, and also since no collections of pus containing the bacillus in question were found which might in this case, as in several which have been reported, have served for the focus of infection.

In a somewhat hasty review of the literature of this bacillus I have been unable to find it as a usual inhabitant of the intestinal canal of children, and Kossel[1] says that among his many examinations of the bacteria of the normal and pathological intestinal canal he has never, except in one instance, found this organism. In the case in which he was able to determine its presence, that of a child, aged four weeks, the symptoms presented were those of diarrhœa, anorexia, and great weakness. The diapers, on exposure to air, became dark green, and the stools were dark green and slimy. The bacillus pyocyaneus was found in great numbers in the stools, with a great diminution of the usual intestinal bacteria. Green vomit developed later, and death took place thirteen days after admission to hospital. In this case pus was present in the right middle ear and the right nasal cavity. From it, and also from the secretions of the larynx and trachea, there were obtained pure cultures of the bacillus pyocyaneus. Kossel believed that the digestive disturbances which caused the child's death were due to this organism derived from the ear.

In this connection the stools of six healthy babies at the Maternity Hospital were examined for the presence of this bacillus, but with negative results, and while this is, of course, when taken alone, proof of nothing, still it is in accord with the investigations of Kossel just mentioned, and also has the support of Lartigau,[1] and of Calmette, whom he quotes. Booker[2] also says that its presence is very exceptional in pathological conditions of the digestive tract. Kranhalls[3] also speaks of its rarity in the same connection.

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[1] Zeitschrift f. Hygiene, xvi., 2.

If, then, it may be assumed from the foregoing reports of various investigators that the bacillus pyocyaneus is not a normal inhabitant of the intestinal tract, infection must have arisen from without, from the air, hands of the attendants, or by means of the food and water. Prenatal infection through the placenta, as proposed by Neuman,[4] to explain cases of infection developing in previously healthy infants shortly after birth, cannot be considered as possible in the present case, the period between birth and the development of symptoms being too long.

While the air of the wards was not examined, it hardly seems probable that this was the source, as only this one child was affected, and also since Symmes in Bergmann's clinic was only able to find this bacillus present in the air once in a long series of examinations, and only then when there was much green pus present in the wards.

It seems to me hardly likely that the infection could have been carried by the hands of the doctors and nurses in view of the careful technique in vogue at the Maternity Hospital, and also because it is very improbable that this child would have been the only one to suffer had its infection had this origin.

As to food infection, the fact that the child was breast-fed would seem, in view of the well-known sterility of breast-milk, to render its relation as a causal agent impossible.

The usual sources of infection having thus apparently failed to explain the infection, I am in doubt as to its solution, and only offer the following inference as a possibility. It is a well-known fact that the occurrence of the bacillus pyocyaneus upon the skin and in the saliva is not very rare, the investigations of Mühsam resulting in its detection upon the skin of the axilla and in the inguinal regions in seven out of fifteen cases examined, while Pansinia and Frick[5] have also found it present in saliva and sputum, and Eberth (*Medicin. Centralblatt*, 1873, and Virchow's *Archiv.*, 1875, lxii.) determined it in sweat, as did also Audouard.[6]

Bearing the above-mentioned facts in mind it has occurred to me that possibly the explanation of the infection might have been found by bacteriological study of the nipple surface of the mother, both because the nipples form very good culture grounds if not carefully cared for, and because the aseptic condition in the puerperium depends more upon the intelligence of the woman herself than does any other portion of the aseptic technique. Moreover, it is to be remembered that among the class of women in the wards of our maternity hospitals the custom of moistening the nipple with saliva before suckling is not very uncommon, which fact, in the light of the investigations by Virchow and Audouard, may render my inference still more plausible.

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[1] Journ. of Experimental Med., 1898, vol. iii.

[2] Johns Hopkins Hosp. Reports, vol. vi.

[3] Compt. rend. Soc. de biol., October, 1897.

[4] Archiv. f. Kinderheilkunde, 1890.

[5] Virchow's Archiv., cxxii., p. 424, and cxvi., p. 266.

[6] Journ. de Medicin de l'Ouest., 1879.

In conclusion I must confess to a certain dissatisfaction in reporting this as a case of pyocyanic infection for the following reasons:

1. Because of the triple infection.
2. Because of the very localized area in which the bacillus pyocyaneus was found in comparison with the distribution of the other two organisms.
3. Because it was not detected in the alimentary tract, a situation where one might have expected to have found it because of the development of the dominant symptom in that locality.
4. Because I failed to attempt its detection in the blood during life.

In spite of the points just mentioned, which may seem to some to be of sufficient gravity to invalidate the case, I still believe it to have been a true case of infection by the bacillus pyocyaneus for the following reasons:

1. The negative history of the first sixteen days of life, followed by an acute illness, the symptoms of which can be explained only by the assumption of an infection.
2. The complete absence of any pathological lesion sufficient to cause death.
3. The presence of the bacillus pyocyaneus in the bile and liver tissue in a condition of virulence. As previously stated, I find that all investigators are in agreement as to the rarity of the occurrence of this organism within the body, and while future study may demonstrate its presence more frequently than we now suppose, I do not believe that it will be found to be a harmless inhabitant of the human body.
4. The association of hemorrhage as a symptom, the presence of the bacillus pyocyaneus having been established, seems to me to afford at least strong presumptive evidence that it was the dominant infection.

DISTORTION OF THE AORTA IN POTT'S DISEASE.

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There appeared in The American Journal of the Medical Sciences for January, 1897, a description by me of a striking instance of this condition. The interest with which it was received by specialists